SMOKING ATTRIBUTABLE MORTALITY, MORBIDITY, AND ECONOMIC COSTS (SAMMEC) LOUISIANA – 1999

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INTRODUCTION/BACKGROUND

Tobacco use continues to remain the leading cause of preventable death and disease in Louisiana accounting for more deaths than AIDS, alcohol, car crashes, murders, suicides, and illegal drugs combined[1]. In the year 1999, cigarette smoking was responsible for 6,427 deaths and 96,085 years of potential years of life lost in Louisiana. More than 750,000 adults[2], 79,000 high school[3] and 28,000 middle school[4] aged children in Louisiana currently smoke cigarettes. More than 100,000 Louisiana youth are projected to die if the current rates of smoking among youth continue[5]. Smokers not only put their lives at risk, but also affect the lives of people around them. In 2000, an estimated 357,000 Louisiana children under the age of 18 years were exposed to Environmental Tobacco Smoke (ETS) inside their homes, which included 91,000 children under 5 years of age[6].

Smoking contributes to illness and death due to cancers, cardiovascular diseases (CVD), respiratory diseases, premature and low birth weight infants, sudden infant death syndrome, and burns. Cigarette smoking also causes a number of serious and chronic illnesses, notably cardiovascular and chronic lung diseases that compromise the quality of life and contribute to substantial time lost from work. Taken together, premature deaths and chronic illnesses that result from cigarette smoking place heavy human and economic costs on the citizens of Louisiana, their families, and employers. When these are added to the economic costs of the medical care incurred, the human and economic costs of cigarette smoking are substantial.

METHODS

SAMMEC (Smoking Attributable Mortality and Morbidity Economic Costs) is a computerized model for estimating the health and economic costs attributable to cigarette smoking developed by the Office of Smoking and Health, US Centers for Disease Control and Prevention (http://apps.nccd.cdc.gov/sammec). This model uses data from the medical literature to estimate the proportion of deaths due to selected diagnoses that are attributable to cigarette smoking and combines this with state based mortality (death certificate) data to estimate the number of deaths due to cigarette smoking. SAMMEC uses standard prevalence-based methods for estimating the economic costs due to these same illnesses.

This current version of SAMMEC estimates the number of smoking related deaths from neoplastic, cardiovascular, other arterial diseases, and respiratory conditions by using attributable risk formulas. These formulas are based on smoking prevalence and relative risks for certain conditions among current and former smokers, which were compared with risks for nonsmokers. Also, calculated are Years of Potential Life Lost (YPLL), medical expenditures, and productivity losses among adults due to smoking.

To assess the impact of morbidity, mortality and economic costs resulting from smoking during pregnancy, CDC developed the MCH SAMMEC (Maternal and Child Health Smoking Attributable Mortality and Morbidity Economic Costs). Results from this analysis are presented in Appendix A.

The four main disease impact measures used in this report are:

- Indirect Costs (Smoking Attributable Productivity Costs – 1999)
- Direct Costs (Smoking Attributable Expenditures –1998)
- Smoking Attributable Fraction of Mortality – 1999
- Smoking Attributable Years of Potential Life Lost (YPLL) – 1999.

Direct costs include medical care expenditures for smoking-related illnesses. Indirect costs include lost income resulting form premature deaths or illnesses due to cigarette smoking.

A. Definitions for Disease Impact measures:

1. Indirect Costs (Smoking Attributable Productivity Costs): Indirect costs are the costs of lost productivity for persons who are disabled by smoking-attributable disease. The relative rate of the SAF (smoking attributable fraction), used in this formula, compares work loss days for employed persons for current and former smokers relative to never smokers. Average daily earnings are computed using participation rates in the labor force, mean annual income, and inputted values for housekeeping services for both non-employed and employed men and women. Earnings are multiplied by average numbers of disability days to estimate total disability costs. Disability costs are in turn multiplied by SAF values.

Smoking-attributable indirect morbidity costs = Average daily earnings x Average disability days per year x SAF.

2. Direct Costs (Smoking Attributable Medical Expenditures): Direct costs are the costs of preventing, diagnosing, and treating smoking-related diseases and medical conditions. The SAMMEC estimate is the sum of 5 components of personal health expenditures –out patient services, hospitalization, medication costs, nursing home costs, and other professional services.

3. Smoking Attributable Fraction of Mortality: The SAF for each impact measure is derived from either relative risk calculations or through multivariate analysis.

4. Smoking Attributable Years of Potential Life Lost (YPLL): Years of Potential Life Lost (YPLL) is a measure of the impact of premature mortality on a population. It is calculated as the sum of the differences between a predetermined minimum or desired life span and the age of death for individuals who died earlier than that predetermined age. The desired age is usually set at 65 in the calculations.

B. Data Sources:

Smoking Prevalence	1999 Louisiana Behavioral Risk Factor Surveillance System (BRFSS)
Mortality	1999 Louisiana Mortality Statistics
Relative Risk	Current Population Survey (CPS)-II (82-88)
Present Value of Future Earnings	US 1999 Present Value of Future Earnings
Life Expectancy	US 1999 Life Expectancy

The data used by the model to generate 1999 estimates of morbidity, mortality, and economic costs for Louisiana include:

- 1999 Louisiana mortality data
- 1999 smoking prevalence data from the Louisiana Behavioral Risk Factor Surveillance System
- Estimated 1998 population data projected from the 1990 US Census
- 1999 US Life Expectancy
- Personal health care expenditures for hospitalizations, physician services, nursing homes, medications, and other professional services as calculated for Louisiana for 1998 by Miller et al.[7] based on data from the Health Care Financing Administration (HCFA).

RESULTS

In 1999, cigarette smoking contributed to an estimated 6,427 deaths in Louisiana, accounting for 16.0% of all deaths in that year. Also, an estimated 96,085 years of potential life was lost (YPLL) as a result of the premature mortality resulting from cigarette smoking. In that year, one in five Louisiana adults (35 years and older) were current smokers. Current smoking rates were higher among African Americans (23.5%) compared to Whites (20.1%). African American males had significantly higher rates of smoking (31.6%) compared to White males (18.5%), but among females, smoking rates were higher among Whites (21.6%) compared to African Americans (18.4%).

The deaths attributable to smoking may be grouped into three broad categories: cancer, cardiovascular disease (CVD) and respiratory disease. Smoking is responsible for a significant proportion of all deaths due to these causes:

- Almost half (47.3%)of deaths due to cancer
- 60% of deaths due to respiratory diseases
- A quarter (25%) of deaths due to CVD in 1999 were attributable to smoking.

For some of the individual causes of death, smoking was responsible for more than 75% of the deaths (cancer of larynx (78.0%), cancer of trachea, lung and bronchus (80.3%),

bronchitis and emphysema (85.5%) and chronic airway obstructive disease (78.3%). In terms of absolute numbers, more males died of smoking attributable causes compared to females. This probably is a reflection of the higher rates of current smoking among males.

Louisiana residents lost an estimated 96,085 years of potential life (YPLL) as a result of the premature mortality resulting from cigarette smoking. Cancer was the leading cause of smoking attributable YPLL in Louisiana in 1999, responsible for 41,890 years of potential life lost (27,088 male and 14,802 female). CVD caused a loss of 38,249 years (22,731 male and 15,518 female). Respiratory diseases caused 15,948 years to be lost (8,118 male 7,830 female).

Total direct and indirect costs for 1999 in Louisiana attributable to cigarette smoking were estimated at $2.81 billion or $645 per capita. Smoking attributable direct medical costs totaled $1,151 million:

- $392 million for ambulatory care
- $308 million for hospitalizations
- $101 million for prescription drugs
- $268 million for nursing home services
- $82 million for other professional services.

Indirect costs due to loss of productivity resulting from the premature deaths for 1999 in Louisiana due to cigarette smoking were estimated at $1,663 million. This included $731 million due to malignant neoplasm's, $755 million due to CVD and $178 million due to respiratory diseases.

LIMITATIONS

The model underestimates the human and economic costs due to tobacco in several ways. These estimates were based on data for cigarette smoking prevalence from 1999. Most smoking-attributable deaths for that year resulted from smoking during preceding decades, when smoking prevalence was considerable higher. Morbidity, mortality, and economic costs due to leukemia, peptic ulcer disease, and other diseases to which smoking illnesses associated with cigar and pipe smoking and smokeless tobacco use are not included. Although mortality from burns and other injuries attributed to smoking related fires are included, the economic costs of such fires are not included.

Cost savings for Medicare, Social Security, and pension funds that result from premature deaths are not considered. Economic contributions of the tobacco industry are not included. In a 1983 study for the Tobacco Institute, Chase Econometrics estimated that the tobacco industry generated 710,000 jobs. This amounts to approximately two jobs for every premature death attributable to tobacco products each year. Chase Econometrics also documented that should the US become tobacco free, most jobs lost in states with sizeable tobacco industries would shift to other industries in non-tobacco states as a result of cigarette smokers shifting their tobacco expenditures to other products[12].

Productivity loss estimates were based on lifetime future earnings data that were weighted by gender to remove the effects of gender discrimination. As a result, productivity losses are

likely to be understated because men have higher average earnings than do women and are more likely to die from a smoking-attributable disease.

The productivity loss estimates are also underestimated because they do not include the value of lost work time from smoking-related illness, absenteeism, excess work breaks, and secondhand smoke-related disease morbidity and mortality.

DISCUSSION

While mortality and YPLL have decreased, economic costs have increased due to three main reasons: inflation has increased, average earnings have increased, and survival rates of CVH incidents have improved. Although deaths from CVH have slowly decreased, quality of life for most survivors declines after the CVH event. Furthermore, higher medical costs are incurred.

The smoking behavior of the population two decades earlier is reflected in the present trends in smoking-attributable mortality. Among women, smoking rates peaked in the late 1970s and lung cancer death rates are now more than four times as high as rates in 1969. Smoking rates among men peaked in the mid 1960s and lung cancer death rates among men reached a peak in the late 1980s, however, after decades of continuous increases lung cancer death rates among men have since fallen slightly.

The number of smoking-related deaths is also influenced by the growth and aging of the population. As 'baby boomers' age, it can be expected that large numbers of Americans will continue to be affected and to die from smoking-related causes, in particular from lung cancer, heart diseases, and cerebrovascular disease.

CONCLUSION

While only one in four adult Louisianans (18 years and older) smoke, everyone shares the $2.8 billion dollars incurred by this minority. Over 15% of the deaths in Louisiana in 1999 were attributable to tobacco.

Approximately 90% of smokers began smoking by the time they were 18 years of age. In Louisiana, 115,577 kids will become regular smokers in 2002. Almost 40,000 of our children in Louisiana will eventually die from their addiction. The deaths, suffering, and economic cost can be reduced if current smokers are able to successfully stop smoking and more importantly, if smoking is not initiated by children and youth. Several strategies have been proven to decrease the smoking rates among children and youth. These strategies include increasing the amount of tax on cigarettes (increasing the excise tax), allowing communities to choose their own environmental tobacco regulations (local option), and other initiatives as outlined in the Centers For Disease Control's Best Practices in Tobacco Prevention.

Appendix A: COSTS ASSOCIATED WITH SMOKING DURING PREGNANCY

INTRODUCTION

According to 1999 Louisiana Vital Statistics Data, a total of 6,722 (10.1%) pregnant women reported smoking during pregnancy. Smoking during pregnancy is associated with increased risks for pregnancy complications, premature rupture of membranes, and modest increase in risk for preterm delivery. Evidence shows that maternal tobacco use is associated with low birth weight, mental retardation and birth defects, such as oral clefts in the newborn. Research suggests that intrauterine exposure and passive exposure to secondhand smoke after pregnancy are associated with an increased risk of Sudden Infant Death Syndrome (SIDS) in infants.

METHODS

To estimate the costs associated with smoking during pregnancy the MCH SAMMEC (Maternal and Child Health Smoking Attributable Morbidity, Mortality and Economic Costs) software was developed by the Centers for Disease Control and Prevention. The software allows states to estimate pregnancy related smoking attributable neonatal cost of care and neonatal mortality (deaths during the first 27 days of life).

The Smoking Attributable Fractions (SAF's) for MCH SAMMEC have been developed using self reported smoking data on birth certificates. In addition, data from MedStat Corporation is used to estimate the average number of NICU (Neonatal Intensive Care Unit) nights incurred by newborns and the average health care expenditures for NICU and Non-NICU nursery nights. The outcome measures calculated using MCH SAMMEC include; infant mortality, percentage of infants with low birth weight, and total neonatal health care costs.

RESULTS

In 1999, neonatal expenditures attributable to maternal smoking during pregnancy stood at $ 5.3 million. There were 20 neonatal deaths attributable to smoking. Smoking during pregnancy resulted in an estimated 1,550 years of potential life lost due to premature mortality among infants.

Table: Smoking Attributable Years of Potential Life Lost (YPLL) – Louisiana, 1999

Cause of Death	Males	Females
Short Gestation/Low Birth Weight	383	454
Sudden Infant Death Syndrome	349	201
Respiratory Distress Syndrome	20	19
Respiratory Conditions-Newborn	47	107
Total	799	751

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SMOKING PREVALENCE FOR LOUISIANA (ALL RACES), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	26.0	27.4	46.6	24.7	19.7	55.6
65+	8.77	47.7	43.5	10.2	29.4	60.4

SMOKING PREVALENCE FOR USA (ALL RACES), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	25.9	31.0	43.1	22.8	22.5	54.7
65+	11.3	53.1	35.7	9.8	27.9	62.2

SMOKING PREVALENCE FOR LOUISIANA (WHITES), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	21.4	32.0	46.6	27.5	22.7	49.9
65+	8.8	51.1	40.2	8.3	33.3	58.4

SMOKING PREVALENCE FOR USA (WHITES), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	25.5	32.2	42.2	24.1	25.1	50.9
65+	10.9	53.6	35.5	10.0	28.8	61.3

SMOKING PREVALENCE FOR LOUISIANA (BLACKS), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	36.2	11.7	52.1	18.6	14.1	67.3
65+	12.0	34.0	54.0	24.1	15.7	66.3

SMOKING PREVALENCE FOR USA (BLACKS), BRFSS, 1999

AGE CATEGORY	MALES			FEMALES		
	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER	CURRENT SMOKER	FORMER SMOKER	NEVER SMOKER
35-64	31.8	25.4	42.9	24.1	16.1	59.8
65+	19.4	45.4	35.2	10.4	24.3	65.3

Table I:

Smoking-Attributable Mortality, Louisiana – 1999

Cause of Death	Males	Females	Total
Malignant Neoplasm's			
Lip, Oral Cavity, Pharynx	66	29	95
Esophagus	96	37	133
Pancreas	52	61	113
Larynx	48	11	59
Trachea, Lung, Bronchus	1,457	717	2,174
Cervix Uteri	0	8	8
Urinary Bladder	44	10	54
Kidney and Renal Pelvis	45	5	50
Total Malignant Neoplasm's	**1,808**	**878**	**2,686**
Cardiovascular Diseases			
Hypertension	69	74	143
Ischemic Heart Disease	828	526	1,354
Other Heart Disease	219	161	380
Cerebrovascular Disease	139	174	313
Atherosclerosis	19	10	29
Aortic Aneurysm	78	58	136
Other Arterial Disease	7	17	24
Total Cardiovascular Diseases	**1,359**	**1,020**	**2,379**
Respiratory Diseases			
Pneumonia, Influenza	81	76	157
Bronchitis, Emphysema	146	105	251
Chronic Airways Obstruction	503	451	954
Total Respiratory Diseases	**730**	**632**	**1,362**
Total	**3,897**	**2,530**	**6,427**

Table II:

Smoking-Attributable Years of Potential Life Lost, Louisiana – 1999

Cause of Death	Males	Females	Total
Malignant Neoplasm's			
Lip, Oral Cavity, Pharynx	1,255	562	1,817
Esophagus	1,483	628	2,111
Pancreas	893	922	1,815
Larynx	912	192	1,104
Trachea, Lung, Bronchus	21,365	12,077	33,442
Cervix Uteri	0	219	219
Urinary Bladder	446	115	561
Kidney and Renal Pelvis	734	87	821
Total Malignant Neoplasm's	**27,088**	**14,802**	**41,890**
Cardiovascular Diseases			
Hypertension	1,177	1,077	2,254
Ischemic Heart Disease	14,637	7,911	22,548
Other Heart Disease	3,116	2,060	5,176
Cerebrovascular Disease	2,508	3,460	5,967
Atherosclerosis	154	91	245
Aortic Aneurysm	1,047	712	1,760
Other Arterial Disease	92	207	299
Total Cardiovascular Diseases	**22,731**	**15,518**	**38,249**
Respiratory Diseases			
Pneumonia, Influenza	846	840	1,686
Bronchitis, Emphysema	1,819	1,464	3,283
Chronic Airways Obstruction	5,453	5,526	10,979
Total Respiratory Diseases	**8,118**	**7,830**	**15,948**
Total	**57,937**	**38,150**	**96,087**

Table III:

Smoking-Attributable Productivity Costs (in millions) Louisiana – 1999			
Cause of Death	**Males**	**Females**	**Total**
Malignant Neoplasm's			
Lip, Oral Cavity, Pharynx	$30	$10	$40
Esophagus	$29	$10	$39
Pancreas	$20	$13	$33
Larynx	$22	$3	$24
Trachea, Lung, Bronchus	$384	$183	$567
Cervix Uteri	$0	$5	$5
Urinary Bladder	$4	$1	$5
Kidney and Renal Pelvis	$15	$1	$17
Total Malignant Neoplasm's	**$504**	**$226**	**$731**
Cardiovascular Diseases			
Hypertension	$27	$16	$43
Ischemic Heart Disease	$341	$122	$463
Other Heart Disease	$61	$27	$88
Cerebrovascular Disease	$60	$71	$131
Atherosclerosis	$1	$1	$2
Aortic Aneurysm	$17	$7	$24
Other Arterial Disease	$2	$2	$4
Total Cardiovascular Diseases	**$509**	**$246**	**$755**
Respiratory Diseases			
Pneumonia, Influenza	$12	$9	$21
Bronchitis, Emphysema	$26	$17	$44
Chronic Airways Obstruction	$65	$49	$113
Total Respiratory Diseases	**$103**	**$75**	**$178**
Total	**$1,116**	**$548**	**$1,664**

Table IV:

Smoking-attributable expenditures for Louisiana – 1998, by cost type					
Ambulatory	**Hospital**	**Prescription Drugs**	**Nursing Home**	**Other**	**Total**
Total Expenditures, 1998 (in millions)					
$4,249	$7,139	$1,507	$1,248	$1,456	$15,599
Source: Center for Medicare and Medicaid Services (CMS) (formerly HCFA)					
Smoking-Attributable Fractions of Total Expenditures					
9.23%	4.32%	6.67%	21.44%	5.66%	7.38%
Source: Miller et al. 1999					
Smoking-Attributable Expenditures (SAE) (in millions)					
$392	$308	$101	$268	$82	$1,151